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ABSTRACT

A program, developed to train teachers to use the computer, is based on the belief that adults acquire computer literacy in the same way that children do: sequentially and with hands-on experience. Programming is taught first. Reliance is placed on peer teaching as well as teaching by a skilled instructor. The role of play is emphasized in learning computer language and techniques. Materials and introductory instruction are provided, and free exploration is encouraged, followed by instructions for extending the play, deepening it, or showing how to progress so that the learning becomes richer and more satisfying. The role of the instructor in this training method is to be available to answer questions, troubleshoot, provide small lessons for trainees ready for them, and support the learning in whatever way seems suitable. After the programming has begun to solidify in the teachers' minds, further aspects of technology are introduced to them. In addition to this program description, a discussion on experiences with teachers is presented by a computer instructor who collaborated in the development of the program. (JD)

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Microcomputers in Classrooms: Implications for Teacher
Education

First Paper by Lodema Burrows

Second Paper by Barbara Dubitsky

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Teacher educators correctly tend to get nervous when they
hear and read about schools joyfully embracing computers as the
most recent solution to all the problems of education in our
elementary and junior high schools. These reports make it seem
as if all that's necessary is to wheel in the machines to the
fifth grade and reading scores will rise and calm will descend
on the lunchroom. As teacher educators, I don't have to tell

you it isn't so.

However, there are school districts in this nation who are mandating that teachers learn to use computers in their classrooms, or that they prepare themselves to use the computer lab productively with their children when it's their turn on the master schedule.

At Bank Street College some time ago we foresaw the need to prepare teachers to use computers in classrooms with children. At the same time that some of us on the faculty were designing the Computer Certificate program which was to prepare teachers to use computers with children in grades 3 through 9 we had just finished or were in the midst ourselves of learning all we could about computers, including programming them. At the same time we were visiting as many classrooms and other places where children were using computers to observe them and to think about how they were learning about computers, both from their peers and from adults.

I believe that it is useful that we were so involved in learning about computers ourselves because it gave us some insights into the teaching/learning process which helped us shape our program.

I'm going to start talking about fear and pain not only because it is dramatic, but because these feelings became so apparent to us as we were learning and teaching teachers about computers.

There is something about the computer which seems to put fear into the hearts of some adults when first confronted by it. It has the ability to make them revert to their early childhood when they were powerless in a world they did not understand.

For these people (teachers among them, present company not excluded, if you want to think I'm talking about me, you may) -- the computer has the amazing power to make them feel stupid. This is an amazing power when you understand that most adults who start learning about computers tend to be of above average intelligence. In fact many of them are successful college graduates and have a string of letters after their names.

I am beginning to wonder if the computer, by its relative newness and complexity does not represent such a terra incognita that these frightened adults have forgotten what they have learned about learning new things.

In the first place, they seem to want to know it all right away. This is no more possible than it is with any other tool.

Few people can immediately drive a car (or a bicycle for that matter). Fewer still can play a pipe organ right away, or sail a boat, or use a radial arm power saw properly. Not only could they not use any of those tools with skill and precision without considerable practice, but also they could not understand the principles which make the tool effective. Yet somehow intelligent adults either believe they will be able to use computers professionally in a very short amount of time, or they feel if they can't, they must be profoundly stupid.

What is common to all these pursuits is that they are tasks which are of sufficient complexity as to require a step-by-step approach and continued practice. Furthermore the learning of the process is separate from understanding the principles from which the tool is derived.

This fact is important because while one is learning one has the sinking feeling that nothing is happening. And the leap from there to believing that it is unlearnable (because one is stupid) is a little leap.

This is true for some people even when they are learning to use simple programs (classroom software for example) on a computer. It is particularly true for many people when they are trying to learn to program. In both instances it is

related to the necessity to get a machine to do something for you when you don't understand how the machine works --not just how it operates, but what are its guiding principles.

In my personal log, kept while I was learning Logo, I complain continually that each time I sit down in front of the computer I feel confident until I hit the first snag, which may be as simple an error message as "Doesn't like 1 as input at level 2 of BOX." and suddenly I feel as if this machine not only knows more than I do but is going to make me learn to do things its way. Here are issues of self-concept and control. I'm used to being confident and in authority and suddenly a tv screen is telling me that I don't meet its expectations!

You may smile at my discomfort but by my experiencing and understanding this feeling about myself and my learning process I can also predict that other teachers will feel this way.

Teachers are accustomed to being confident and in control. They won't take kindly to being challenged by a box, particularly when some of the children in their classrooms know more about how to make the computer work than they do. In building a program to train teachers to work with computers this is important information.

This leads us to consider the question: should all teachers learn how to program in order to work with computers in classrooms. In general I would say yes. But it is a qualified yes. Yes to the extent that learning to program forces the teacher to grapple with a computer language, and in discovering how to "talk to the computer" learns more about how the computer works and what it can and cannot do.

Teacher educators, then in planning to prepare teachers to use computers in classrooms with children will encounter basically two kinds of teachers: those who are highly motivated to learn the use of a new tool and are fascinated with the idea of computers, and those who are told to use computers in their classrooms and are scared to death of the whole idea. In my experience some of each of these kinds of teachers will exhibit some of the learning problems which I have described above.

Let us look at some of the ways computers are used in elementary and junior high school classrooms. When they are used to teach programming, usually Logo or BASIC they are generally thought of as helping to develop thinking skills or to learn a computer language. Computers are used as tools: word processors, to help with writing skills, powerful

calculators to help with math problems, and as file systems and graph designers to help with research. Furthermore they are used in some classrooms for computer assisted instruction (CAI) in the form of drill and practice (as animated workbooks) and for game playing. Their use actually as part of the curriculum (programs which teach longitude and latitude through actually simulating navigation) is just beginning to become common in classrooms.

Teachers need to learn a great deal about these various uses of the computer if they are going to make appropriate choices of how they will use the computer in their classrooms. These choices will undoubtedly be made on the basis of what learning theory or theories the teacher and the school subscribes. At Bank Street we operate from a child development base, and use an interactive experiential approach where materials in the learning environment are carefully chosen by the teacher for specific purposes. The emphasis is on the doing being done by the learner. Since this is the approach we expect teachers to take with children, it is the one we take with the teachers-in-training.

Thinking again of how we ourselves learned about computers, and remembering the amount of time it took us to use the machine in order to become comfortable and proficient on it, we decided that our training program had to be done on and

near computers. Our ratio was one computer for each two students.

Programming is taught first. We teach the Logo language because we believe that it is the best among the languages available to be used in elementary schools. For programming we rely on peer teaching, as well as teaching by a skilled instructor. Our observation of children's learning of Logo is that much of the learning happens peer-to-peer. In fact, we discovered that a very efficient way to teach a concept to a whole group is to teach it to one person first, and then watch it spread throughout the group as one after another person discovers the need for that idea, or see the effect of the idea on someone's program.

We also emphasize the role of play in learning the language. My notion of play on the computer is much like the ideal of play in a kindergarten block corner. The teacher provides the materials and allows children free exploration at first and then begins to make suggestions for extending the play, deepening it or showing how to take next steps so that it becomes richer and more satisfying.

The role of the instructor in this method is to do that as well as to be available to answer questions, to troubleshoot, to provide small lessons for whomever is ready

for them, to support the learning in whatever way seems suitable, to suggest resources such as handbooks and readings and other people to talk with, and finally, to understand and undergird the process (including the pain).

After the programming has begun to solidify in the minds of the teachers, and after we have attempted to demystify the computer, then we start examining other aspects of the technology with them. Teachers are encouraged to become familiar with a wide range of software, to develop their own criteria for evaluating software for use in their own classrooms, to try out selected pieces of software with children, and then to modify it for those particular children, and ultimately to create their own programs. Sharing their ideas with other teachers is an important part of this program and is encouraged throughout.

A practicum is provided so teachers can teach children and other teachers what they have been learning. One of our assumptions is that any teacher learning computer use now is likely to be doing some staff development in computers with other teachers in the near future.

When I visit classrooms in elementary schools where teachers with this kind of training are using computers with children, I see a variety of things going on. In fact, no two

classrooms have approached computer use in just the same way. In general there is anywhere from one to six machines throughout the room or arrayed in a bank along a shelf. From two to twelve children are at the machines, almost always in pairs. There is some interaction, but it usually appears purposeful and controlled. This is true whether the kids are engaged in programming or using word processors or other kinds of software.

I have always been amazed that there is so little overt competition and so much cooperation visible. Even when kids play games on the computer like Snooper Troops or Cranston Manor, they say things like "Try West," or "Go up," rather than "Let me do it," or "You can't do it."

This leads me to my final observations about computer use in classrooms. It is about anticipated and unanticipated outcomes.

There is currently so much computer-hype on the one hand and so much concern over what computers may replace in the life of schools -- a good example of this dialogue was recently expressed on the Op-ed page of the New York Times in an article by a junior at Cincinnati Country Day School. Howard Ullman made an elegant plea that computers be used not for CAI, but as tools for students after they have mastered the central

concepts of a discipline. He states, "There is no technological short cut to the goal of learning to think."

His essay was promptly responded to in the Letters to the Editor column by a teacher of elementary math and computer programming at a New York City independent school. Gail Gabler says she has seen evidence of children using programming to learn how to think. The process of creating a program is the process of ordering ideas, she states. "While a computer is not mandatory for any of the above skills development, it is the catalyst [for many children]", she continues.

And there you are. The computer is not going to change American education singlehandedly. It will, however, prove to be a catalytic agent which I believe can help teachers look more closely at their own learning processes, those of the children they teach. If it does that, these observations can lead these teachers to make more informed choices about what they offer their children in their curricula and in experiences in their classrooms.

Karen Scheingold, a colleague of ours at Bank Street who leads the College's research in the Center for Children and Technology calls computers "a chameleon in the classroom," which takes on the character of the people who control it.

I suspect that this attribute of the computer will produce outcomes which were little anticipated when computers were so heartily embraced by the educational community for both good and ill.

Teacher educators will have great influence over how computers are used by teachers in classrooms throughout the nation mainly because teacher educators design the programs through which teachers learn to use computers. When these programs take into account how teachers learn and how they feel about learning, they form models of how teachers will use computers in their own classrooms. Many studies have demonstrated that teachers tend to teach as they have been taught.

In recognizing that computers are tools -- and that novices can learn to use these tools with precision and grace to enhance learning and thinking -- teacher educators can make a significant contribution to the impact of computers in the classrooms throughout the United States.

Microcomputers in Classrooms:
Implications for Teacher Education

Speaker: Barbara Dubitsky

I would like to outline the process we went through at Bank Street College to develop the Computer Certificate Program Lucy discussed. I will also add a bit about a course we will use for the masters degree program in computers in education that will start next fall. What I have most enjoyed in this process has been developing and teaching courses in collaboration with colleagues. I will spend most of the time talking about two of these collaborations.

In the Summer of 1980 I learned the Logo computer language so I could participate in the research Bank Street was about to embark on. This research was to be a natural experiment in two classrooms at Bank Street's Children's School. We wanted to find out what would happen if children had computers with the Logo language available to them whenever they wanted to use them in their classrooms. I worked with the teachers, the children and the researchers as we tried to make sense of what computers with the Logo language could do to enhance children's learning. Most of the children really enjoyed using the computers. They did creative things with them. They worked together well and learned a lot from each other.

I then went out to other schools to help teachers learn about computers and use them in their classrooms. There was something that surprised me in the first school system where I worked, something I should have known but somehow didn't. I had taught a short course to the teachers introducing them to the Logo computer language. In the course I modeled for them the way I hoped they would use computers in their classrooms. They could come to mini-lessons which taught them the same thing many times until they felt they understood. I made it clear that they should learn at their own

pace, that they should find out what they could do with what they knew - that the object wasn't learning all about the language but using it as a tool. They were wonderful students, they got very excited by what they could do with the computer.

However, when I went to the classrooms in that school district I found many teachers using computers in ways that I thought were not educationally sound. For example, a teacher had written a program to make a box on the blackboard of her first grade classroom. The children were to copy it into the computer. These children had no idea of what they were doing. They had no understanding of Repeat 4 [FD 50 RT 90]. I learned that it wasn't the computer that had made the children at Bank Street do creative work - it was the teachers. It became clear that we would have to do a lot more than model behavior if we wanted teachers to use computers in ways that would enhance children's learning.

We were well aware of this when we designed the computer certificate program. The heart of that program is a course with a very long title: "Theory and Practice of Computer Use in Educational Settings." As director of the certificate program, I was in a position to choose the people to develop that course. Knowing it would be an exciting course to teach, I chose myself. I also chose Lucy Burrows, a person who had taught children teachers and teachers of teachers for many years. She is seen by the faculty of Bank Street as an expert in curriculum for middle years children. She has also done extensive work with teachers in Puerto Rico and has thought a great deal about how one's culture effects ones learning style. The second person is Harriet Cuffaro who taught young children for many years, teaches many courses at Bank Street, including the early childhood curriculum course. She is a Dewey Fellow, having been awarded a fellowship

by the John Dewey Foundation to study the effects of computers on young children.

I was relying on Lucy and Harriet for the theoretical knowledge about child development, observing learners and curriculum. They were relying on me for knowledge about computers and computer software. The course was to help the students establish a critical framework for their use of computers in schools. As we designed it together we had to say to each other what learning and teaching were all about. We considered such basic questions as: What does "Educationally Sound" mean? What are the elements that determine what and how a person should teach a given group of children? We had a truly unique opportunity to share our knowledge with each other. I think part of the reason we could examine such basic issues together was the newness of computers. None of us felt we were already supposed to know how to teach about them. While we taught the course we met once a week to go over what happen during the previous class and plan the next.

What we ended up having was a seminar for ourselves about education, the teaching of teachers, the place of computers in the classroom. This seminar was enhanced by the contribution of our students - all of whom were practicing teachers or principals.

What I learned from our collaboration can only be hinted at. I thought a lot about the issues we discussed, such as: Who will be left out in this computer revolution ... the poor? Girls?... What are the real reasons that everyone is so excited about putting computers in schools? If you cleared everything out of your classroom and brought back in only those things you really needed to teach what you felt was important would you bring in a computer? What can teachers do

about the general belief that without knowledge of computers children won't be prepared for the future? How does the developmental level of children effect how they should use computers? I also learned more subtle things. Because we discussed the learning of the students we were teaching, I learned to observe them more carefully. I found that Lucy and Harriet noticed much more about such things as facial expression and how people added to the discussions than I did. I could go on for hours about this course I won't, but I want to add that we also learned a lot about each other --and became closer colleagues-- and we had a great deal of fun.

The other collaboration I will discuss grew out of a conference dealing with computers in Special Education. I attended the conference with members of the Special Education faculty of Bank Street. During the conference we conceived of a course which would help people examine the ways they learn by learning to program the computer. Two of us taught that course last weekend. During the nine months between the conference and last weekend three of us had many meetings in which we videotaped ourselves while I taught them some elements of programming in the Logo language. We talked about their ways of learning and the ways I taught. For example, Linda, we discovered, was completely blocked when she had to deal with large numbers. But she found she could do mathematics if she thought of it only in spacial terms. Bernice, on the other hand, had great trouble with all spacial concepts but with a pencil in her hand she solved everything using words and numbers. I found that I was extremely task oriented, I had material to teach and I wanted to teach it. I didn't want to talk about other things.

We talked a lot about different elements in the learning process and

the importance of a teacher knowing his/her own best learning modes. We all have less trouble teaching the people who learn like we do. The challenge is in being able to teach someone who learns differently than you do. You are not even aware of this difference in learning modes unless you know your own. That was the thesis of the last weekends course. Again, I was the one who knew about computers. My coteacher, Bernice Wilson, is a psychologist who knows a lot about learning theory, and has been teaching courses in special education for years.

I won't bore you with the details of the course. People taught each other, examined their ways of learning and teaching. They tried teaching people who learned differently than they did. It was wonderful experience for both Bernice and I. We can't wait to do it again. We will incorporate this course into a Computer/Special Education course we will use in our masters degree program.

One of the things that we hadn't planned for (there were many) was that people began discussing how comforting the atmosphere was. Since everyone was teaching, they knew they could rely on fellow students for help when they needed it. People began to contrast this with their classrooms where the only permissible source of help was the teacher - a very busy, often unavailable person. After all, the children were always supposed to be quiet when they worked. It sounded like some of them might consider changing this situation!